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GENERAL ELECTRIC COMPANY
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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

MAILED

OCT 31 2007

GROUP 1700

Application Number: 10/671,851
Filing Date: September 26, 2003
Appellant(s): JACKSON ET AL.

Francis T. Coppa

For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 27 July 2007 appealing from the Office action mailed 28 November 2006.

**(1) Real Party in Interest**

The real party in interest is General Electric Company.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

No amendment after final has been filed.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

| | | |
|---|---|---|
| 6,692,586 | Xu et al. | 02-2004 |
| 4,836,849 | Svedberg et al. | 06-1989 |
| 6,428,910 | Jackson et al. | 08-2002 |

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 3, 5-9, 12-17, 23, 25 and 27-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 6,692,586).

In regards to claims 1 and 23, Xu et al. ('586) disclose a method of providing a composition that comprises providing a powder up to about 43.4 weight percent chromium, up to about 26.3 weight percent aluminum, up to about 98.3 weight percent niobium, up to about 91.5 weight percent titanium, up to about 71.5 weight percent silicon, up to about 89.5 weight percent hafnium, and up to about 2.25 weight percent boron (col. 3,lines 4-12); mixing (blending/reacting depending upon the powder blend and temperature) the individual alloys (col. 4, lines 9-26); pressing or forming into foils, rods, billets or buttons and the like (consolidating) (col. 4, lines 60-69); heating the composition to a temperature selected to be at least about 1200°C and less than about 1500°C (col. 8, lines 55-67); conducting a diffusion heat treatment at a temperature between about 1100°C and about 1425°C to allow the composition to diffuse into a substrate and/or allow the low-melt alloy composition to diffuse into high-melt alloy compositions (col. 8, line 65 – col. 9, line 19), thereby having a metal phase in addition

to an intermetallic phase. The Examiner notes that the treatment temperatures disclosed by Xu et al. ('586) overlap the temperature limitations of the instant invention, which is a prima facie case of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select a final reaction temperature higher than that of the initial temperature because Xu et al. ('586) disclose substantially the same method throughout the disclosed temperature limitations.

In regards to claims 3 and 25, Xu et al. ('586) disclose up to about 98.3 weight percent niobium, up to about 91.5 weight percent titanium, and up to 89.5 weight percent hafnium (col. 3,lines 4-12).

In regards to claims 5 and 27, Xu et al. ('586) disclose up to about 43.4 weight percent chromium, up to about 71.5 weight percent silicon, and up to about 2.25 weight percent boron (col. 3,lines 4-12).

In regards to claims 6-8 and 28-30, Xu et al. ('586) disclose a method of providing a composition that comprises providing a powder up to about 43.4 weight percent chromium, up to about 26.3 weight percent aluminum, up to about 98.3 weight percent niobium, up to about 91.5 weight percent titanium, up to about 71.5 weight percent silicon, up to about 89.5 weight percent hafnium, and up to about 2.25 weight percent boron (col. 3,lines 4-12), which overlap the compositions of the instant invention. With respect to the "up to" language for the compositions of germanium, iron, tin, tungsten, and molybdenum, the Examiner notes that these elements would not be critical to the composition because "up to" includes 0 weight percent.

In regards to claims 9 and 31, Xu et al. ('586) disclose that germanium may be included in the powder (col. 3, lines 35-55). Xu et al. ('586) also disclose up to about 43.4 weight percent chromium, up to about 71.5 weight percent silicon, and up to about 2.25 weight percent boron (col. 3,lines 4-12). Therefore, it would have been obvious to one of ordinary skill in the art to select an amount of germanium, silicon, and boron within the range of 5 atomic percent and 25 atomic percent.

In regards to claim 12-13 and 34-35, Xu et al. ('586) do not specify the temperature at which the powder would be pressed or formed into foils, rods, billets or buttons and the like (consolidating) (col. 4, lines 60-69). However, room temperature pressing or forming would be within the scope of Xu et al. ('586).

In regards to claims 14 and 36, Xu et al. ('586) disclose pressing or forming into foils, rods, billets or buttons and the like (consolidating) (col. 4, lines 60-69). The time to form a desired shape would be result-effective in the desired shape of the resulting powder product. MPEP 2144.05 II.

In regards to claims 15-17 and 37-39, Xu et al. ('586) disclose allowing the composition to diffuse into an underlying substrate and/or allowing the low melt alloy composition to diffuse into high melt alloy compositions at temperatures in the range of about 1100°C to about 1425°C for a time period of 1 hour to 100 hours.

Claims 10-11 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 6,692,586) in view of Svedberg et al. (US 4,836,849).

Xu et al. ('586) disclose a method of forming a composition that would have up to 98.3 weight percent niobium as shown above, but Xu et al. ('586) do not specify that the pressing of the powder would include cold isostatic pressing, hot isostatic pressing, hot pressing, explosive consolidation, magnetic pulse consolidation, ram pre-extrusion consolidation, hot forging, hot swaging, and hot extrusion.

In regards to claims 10-11 and 32-33, Svedberg et al. ('849) disclose a method of forming a niobium based composite utilizing a technique selected from hot rolling, hot isostatic pressing, cold pressing, and hot pressing in order to form shapes useful in applications such as turbine blades, combustors, and nozzles of jet engines that require high strength at high temperature in the presence of oxygen (col. 3, lines 1-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a technique of pressing such as hot isostatic pressing, cold pressing, and hot pressing, as disclosed by Svedberg et al. ('849), into the method of forming a composition, as disclosed by Xu et al. ('586), in order to obtain a shape that would be useful in applications such as turbine blades, combustors, and nozzles of jet engines that require high strength at high temperature in the presence of oxygen, as disclosed by Svedberg et al. ('849) (col. 3, lines 1-50).

Claims 18-20 and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 6,692,586) in view of Jackson et al. (US 6,428,910).

In regards to claims 18-20 and 40-42, Xu et al. ('586) disclose a method of forming a composition that would have up to 98.3 weight percent niobium as shown

above, but Xu et al. ('586) do not specify that the composition would have a graded composition.

Jackson et al. ('910) disclose a niobium based composition with a monolithic or graded surface composition (col. 4, lines 25-68). A graded surface composition provides oxidation resistance throughout turbine operation (col. 4, lines 25-68).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of forming a composition, as disclosed by Xu et al. ('586), by applying a graded surface layer, as disclosed by Jackson et al. ('910), in order to provide oxidation resistance throughout turbine operation, as disclosed by Xu et al. ('586).

Claims 19-21 and 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 6,692,586) in view of Svedberg et al. (US 4,836,849).

In regards to claims 19-21 and 41-43, Xu et al. ('586) disclose a method of forming a composition that would have up to 98.3 weight percent niobium as shown above and ball milling to form a powder from the composition (col. 7, lines 57-67), but Xu et al. ('586) do not specify applying an environmentally resistant/thermal coating.

Svedberg et al. ('849) disclose an oxidation resistant coating for a niobium based composition containing chromium, titanium, aluminum, and/or boron; aluminides containing chromium, iron boride, silicon dioxide, iron, nickel, and/or silicon; or noble metal coatings containing platinium, rhodium, hafnium, and/or iridium (col. 3). The coating would provide oxidation resistance (col. 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of forming a composition, as disclosed by Xu et al. ('586), by applying a coating of chromium, titanium, aluminum, and/or boron; aluminides containing chromium, iron boride, silicon dioxide, iron, nickel, and/or silicon; or noble metal coatings containing platinium, rhodium, hafnium, and/or iridium, as disclosed by Svedberg et al. ('849), in order to provide oxidation resistance, as disclosed by Svedberg et al. ('849) (col. 3).

**(10) Response to Argument**

First, the Appellant primarily argues that although the composition of Xu et al. ('586) contains some elements which happen to be similar to the elements of the present invention, the overall braze material has nothing to do with the present invention and Xu et al. ('586) do not disclose or suggest the mechanical deformation/reaction steps for the refractory metal/silicide precursor, as in the present claims. In response to this argument, the Examiner notes that Xu et al. ('586) disclose a method of providing a composition that comprises providing a powder up to about 43.4 weight percent chromium, up to about 26.3 weight percent aluminum, up to about 98.3 weight percent niobium, up to about 91.5 weight percent titanium, up to about 71.5 weight percent silicon, up to about 89.5 weight percent hafnium, and up to about 2.25 weight percent boron (col. 3,lines 4-12); mixing (blending/reacting depending upon the powder blend and temperature) the individual alloys (col. 4, lines 9-26); pressing or forming into foils, rods, billets or buttons and the like (consolidating) (col. 4, lines 60-69); heating the

composition to a temperature selected to be at least about 1200°C and less than about 1500°C (col. 8, lines 55-67); conducting a diffusion heat treatment at a temperature between about 1100°C and about 1425°C to allow the composition to diffuse into a substrate and/or allow the low-melt alloy composition to diffuse into high-melt alloy compositions (col. 8, line 65 – col. 9, line 19), thereby having a metal phase in addition to an intermetallic phase. The contact of a metal with silicon at an elevated temperature would result in the formation of silicides rendering silicon a silicide precursor. Also, the instant specification does not exclude a braze alloy from forming a refractory metal intermetallic composite.

Second, the Appellant primarily argues that Xu et al. ('586) fails to suggest the higher-temperature reaction step wherein the metal-intermetallic phases are formed; most of the heating steps in the reference are in no way similar to the Appellant's powder blend reaction step; and the steps have nothing to do with the preparation of an RMIC. In response to this argument, the Examiner notes that Xu et al. ('586) disclose heating metals such as chromium, niobium, aluminum, titanium, and hafnium with non-metals such as boron and silicon to temperatures in the range of about 1100°C and bout 1425°C and bonding and/or repairing niobium based alloys (col. 3, lines 4-12 and col. 9, lines 1-33) which would indicate the presence of a chemical reaction; Xu et al. ('586) disclose temperatures greater than about 1050°C as required by the instant invention (claims 16 and 38); and Xu et al. ('586) disclose applying substantially the same method steps to an overlapping powder composition. Therefore, one of ordinary skill in the art would expect the same or a substantially similar resulting product.

Third, the Appellant primarily argues that there are specific advantages to having a first temperature treatment less than about 1050°C and a second temperature treatment greater than 1050°C. In response, the Examiner notes that instant claim 1 includes that the first temperature involves consolidating and mechanically deforming the powder. Xu et al. ('586) disclose pulverizing, pressing, and/or forming into foils rods, billets, or buttons and the like with no temperature limitation (which would include room temperature) (col. 4, lines 60-67) and conducting a diffusion heat treatment at a temperature between about 1100°C and about 1425°C to allow the composition to diffuse into a substrate and/or allow the low-melt alloy composition to diffuse into high-melt alloy compositions (col. 8, line 65 – col. 9, line 19). Xu et al. ('586) further disclose slurring the composition (col. 7, line 67). Therefore, the specific advantages that are referred to by the Appellant would also be present in Xu et al. ('586).

Fourth, the Appellant primarily argues that Svedberg et al. ('849) fails to describe the consolidation deformation/reaction steps for a refractory-silicide composition. In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Examiner notes that Xu et al. ('586) disclose pressing and/or forming into foils, rods, billets, buttons and the like (col. 4, lines 60-67). The Examiner also notes that Svedberg et al. ('849) disclose hot rolling, hot pressing, hot isostatic pressing, and cold pressing to form shapes that be useful in turbine blades, combustors, and nozzles of jet engines

that require high strength at high temperature in the presence of oxygen. Therefore, the combination of Xu et al. ('586) and Svedberg et al. ('849) to form useful shapes by different pressing techniques would have been obvious.

Fifth, the Appellant primarily argues that Svedberg et al. ('849) fails to suggest the preparation of the graded composite recited in claim 18. In response, the Examiner notes that Svedberg et al. ('849) was not applied in the final rejection against claim 18.

Sixth, the Appellant primarily argues that Jackson et al. ('910) do not specify the processing steps of the instant invention; Jackson et al. ('910) only describe a graded surface layer; and Jackson et al. ('910) never describe the preparation of a graded composite by a sequence of deformation/reaction steps. In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Examiner notes that Xu et al. ('586) disclose a method of forming a composition that would have up to 98.3 weight percent niobium (col. 3,lines 4-12). The Examiner also notes that Jackson et al. ('910) disclose applying a graded surface layer to a niobium based composition (col. 2, lines 34-48 and col. 4, lines 50-60) in addition to a homogenous or phase-layered core (col. 5, lines 3-10) in order to provide sufficient oxidation resistance during turbine operation (col. 4, lines 50-60). The Examiner asserts that there would be a surface composition in addition to a core composition and a graded surface and/or a graded core would meet the limitation of a graded composition. Therefore, the combination of Xu et al. ('586) and

Jackson et al. ('910) to achieve oxidation resistance during turbine operation would have been obvious.

Seventh, the Appellant primarily argues that the ball milling technique and the coating technique are limitations found in independent claims 1 and 23 and that the initial method was never suggested. In response, the Examiner notes that ball milling and coating are not recited in independent claims 1 and 23. Xu et al. ('586) disclose ball milling to provide a powder that would contain up to about 98.3 weight percent niobium (col. 3, lines 4-12 and col. 7, lines 57-67). Svedberg et al. ('849) disclose an oxidation resistant coating for a niobium based composite containing chromium, titanium, aluminum, and/or boron; aluminides containing chromium, iron boride, silicon dioxide, iron, nickel, and/or silicon; or noble metal coatings containing platinum, rhodium, hafnium, and/or iridium (col. 3). Therefore, the combination of Xu et al. ('586) and Svedberg et al. ('849) to achieve oxidation resistance would have been obvious.

Eighth, the Appellant indicates that claims 23, 25 and 27-43 were objected to as being a substantial duplicate of claims 1, 3, and 5-21. In response, the Examiner notes that these claims were not objected to. However, the Examiner issued a warning in the Final Office Action that if claims 1, 3 and 5-21 were found allowable that claims 23, 25 and 27-43 would be objected to 37 CFR 1.75 as being a substantial duplicate of claims 1, 3 and 5-21 due to a lack of clear definitions within the specification that distinguish an "article" from a "composite".

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Jessee Roe

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